I- Which of the following statements is ***true***, and correct the ***false*** ones:

   a. The perimeter of an equilateral triangle is proportional to the length of one of its sides.

   b. The point $A(0;0)$ belongs to any linear function.

   c. To increase the price of an item by 100% is to multiply its initial price by 2.

   d. $200g$ represents 12% of the mass of a Laptop, then the mass of the Laptop is $550g$.

   e. To decrease the price of an item 50% is to multiply its initial price by $\dfrac{1}{2}$.

   f. The point $R(n;n)$ belongs to any linear function.

   g. If the price of a smart phone increases by 10% per month, then the price of the phone after three consecutive months will be increased by 30%.

II- Prove that the table given below is a table of proportionality:

0.015×10^2	$3.5 - \dfrac{3}{2}$	$\left(\dfrac{9}{10}\right)^{-1}$
$\dfrac{3}{2} \times \dfrac{4}{5} \div \dfrac{8}{5}$	1	$0.555\ldots$

III- Nada scored 85% out of 20 questions of her Mathematics test.

   a. How many correct answers did Nada answer correctly?

   b. Write an algebraic relation that allows Nada to compute easily the number of correct answers *y* among *x* questions in her next test.

IV- 50 drivers applied for a license test, only 35 out of them succeeded. Find the percentage of the drivers who failed the test.

V- Find a, b & c which are respectively proportional to 20; 3; 2 & whose sum is 400.

VI- *__Answer the following independent questions:__*

   a. A closed container includes 13 orange balls, 6 green balls, and 11 yellow ones.

     i. What is the percentage of the green balls?

     ii. Determine the ratio of the yellow balls to the: 1) Green. 2) Total.

   b. If your monthly rental is increased from 240$ to 300$, what is percentage of increase?

   c. The length of a band is $3cm$ when stretched by 15%. Find the normal length of the band.

   d. The angles of a triangle are proportional to 1, 2 and 3. Calculate value of each angle. Then deduce the type of this triangle.

   e. Ali has 600$ after, spending 20% of his money, and 25% of what has remained. How much money did he have at first?

VII- Two items *R* and *N*, originally of the same price are subjected to an increase in price.

   ✓ The price of the item *R* is increases by 40% then by another 30%.

   ✓ The price of the item *N* increases by 50% then by 20%.

Would both items have the same price after both increases? Justify.

VIII- Consider a rectangle of length (**L**), width (**W**) and area (**A**). If a new rectangle is to be obtained by **enlarging L** by 20% and **reducing W** by 20% then what is the **new area A'** of the new rectangle? (*Lycee Des Arts 3rd-Trial 13-14*)

IX- In the orthonormal system of axes $(x\,'Ox;y\,'Oy)$, consider the two straight lines $(d)\,\&\,(d')$, the graphical representation of the functions $f\,\&\,g$ respectively.

1) Which of the given functions is linear? Justify.

2) a) Determine the sense of variation of $f\,\&\,g$.

   b) Deduce the signs of the slopes of $(d)\,\&\,(d')$.

   c) Compare, *without calculations*:

     i) $f(2010)\,\&\,f(2017)$.

     ii) $g(-500)\,\&\,g(-750)$.

3) Determine **_graphically_**:

   a. The image of "2" by g.

   b. The pre-image of "2" by f.

4) a) Prove that f can be defined by its image $f(x)=\dfrac{4}{5}x$.

   b) Calculate the image of "20" by f.
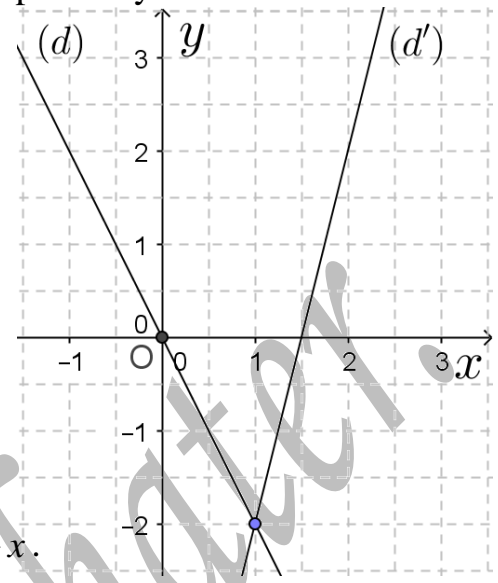
   c) The antecedent of "-35" by f.

5) Consider the equation: $f(x)=g(x)$.

   a. What is the meaning of the above equation:

     i. Algebraically?

     ii. Graphically?

   b. Solve, **_graphically_**, the equation: $f(x)=g(x)$.

X- The length of an elastic spring is x, find the new length y if the spring is:

   c. Elongated successively by 12% then 25%.

   d. Compressed successively by 25% then 15%.

   e. Extended by 13% then shortened by 10%.

   f. Elongated by 47% then compressed by 47%.

XI- The original price of a 164**GB** flash memory stick is 80\$. But its price drops to 65\$.

   a) What is the percentage of the reduction with respect to the original price?

   b) To buy an imported item one has to pay an equivalent of 12% VAT of the price. How much would the memory stick cost?

   c) Find the primary cost of an imported item which is sold for 1200\$.

XII- The social security service pays a patient 85% of their hospital expenses. The mutual insurance company pays them 65% of the rest. If the hospital's bill is 3 525 000 L.L. Find the amount of money the patient still have to pay.

XIII- The grades of a student in three math tests are proportional to 1, 2 and 3. Find his grade in each test if the sum of their squares is 504.

XIV- Let a and b be two numbers belong to $\mathbb{N}$, such that their ratio is $\dfrac{4}{3}$ and the sum of their squares is 400. Find a and b.

XV- A HD TV set costs 850\$, its price elevates by 10% in December, followed by another increase of 10% in January.

   a. Determine the final price of the TV set.

   b. Write an algebraic expression that represents both increases.

XVI- Mr. Gobran earns 910\$ per month.

   1) His employer decides to pay him his salary in two different payments that are proportional to 2 and 5. Compute the amount of money Mr. Gobran takes in each payment.

   2) He receives two successive bonuses on his salary 20% then 10%.

     i. Find Mr. Gobran's income from this company after the last raise.

     ii. Is his salary increase equal, greater than or less than 30%? Justify.

     iii. Let S represent the salary of Mr. Gobran and E be his salary after the increase. Express E in terms of S.

XVII- A school runs an election each year to choose a representative for the students at the school board. The total number of votes is 2300; a candidate won 65% of the votes.

   a) Find the number of votes this candidate received.

   b) Another candidate got 525 votes. Find the percentage of votes he obtained.

   c) If there was third candidate. Can you find the percentage of students that voted to him?

XVIII- The price of an item is **increased by** 25% **at the beginning of the spring season** but it **returns to its initial price at the end of this season**. Find the percentage of **decrease.**

XIX- In a car exhibition 10% of the cars are ***Honda***, $\frac{2}{3}$ of the cars are ***BMW***, $\frac{1}{5}$ of the cars are ***Porsche*** and 30 cars are ***GMC's***. Is the number of cars in this exhibition 200?

XX- In the following orthonormal system of axes *M* is a variable point of abscissa *x*:

   a. Find the coordinates of each of the four given points.

   b. Determine the area *y* of triangle *OAM* in terms of *x*.

   c. Complete the following table based on the above relation:

x	1		3	
y		3		6

   d. Place on the same *xy*-plane the points $(x; y)$ determined in the above table.

   e. What does the traced curve indicate?

   f. For what value of *x* is the area of triangle *OAM* double that of parallelogram *OBDC*?
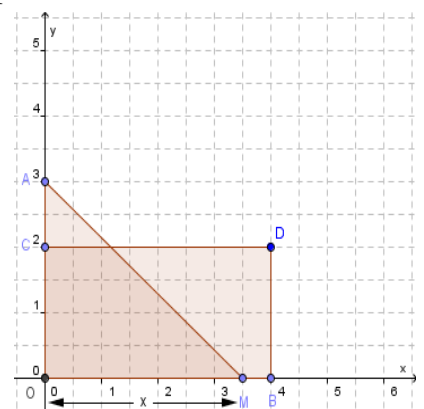
XXI- A fitness club offer his clients the following options:

1st - Option: Pay a 30\$ deposit per month plus 3\$ per each visit.

2nd - Option: Pay 8\$ per each visit only.

3rd - Option: Pay 60\$ for unlimited number of visits per month.

1) Let: x be the number of visits; y_1, y_2 & y_3 be the total payments of 1st, 2nd & 3rd – options respectively.

    b. Express for each option, the total payment in terms of x if possible.

    c. Recopy and complete the following table.

X	3	6	10	12
y_1				
y_2				
y_3				

2) Use the above table to represent graphically the given options.

    Scale: 1cm represents 1 visit.

              1cm represents 10\$.

3) Which of the first two options is more beneficial, if the customer attends the club:

    a. 3 - times per month?   ***c.*** 6 - times per month?

    b. 4 - times per month?   ***d.*** 9 - times per month?

4) Determine the value of x, for which the 1st - option is more advantageous.

5) Solve the equation $y_2 = y_3$ and interpret the obtained result.

6) Discuss graphically, according to the values of x, the cheapest option for the visitor.

7) A customer chooses the 2nd - option and pays 150\$.

    a. Indicate the number of times that this customer attended the club.

    b. Did he choose the right option? Justify.

XXII- A volley-ball team decides to change their uniform. A number is to be printed of each uniform. The following offers are considered:

  Option-1: Each non- printed uniform costs 12.5\$

          This price is increased by 12% for printing the number on the uniform.

  Option-2: Each non- printed uniform costs 9\$

          The cost of printing the numbers on all uniforms of the team is 50\$

Let x be the number of uniforms bought.

Let y_1 & y_2 be the final costs of x uniforms choosing options 1& 2 respectively.

1) Show that $y_1 = 14x$

2) Prove buying 2 uniform choosing 2nd option will cost 68\$

3) Express y_2 as a function of x.

4) Solve the inequality: $14x > 9x + 50$, interpret your result.